



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/061,377	02/01/2002	Thomas D. Schneider	4239-62014	2399
36218	7590	07/29/2005	EXAMINER	
KLARQUIST SPARKMAN, LLP 121 S.W. SALMON STREET, SUITE #1600 ONE WORLD TRADE CENTER PORTLAND, OR 97204-2988			SMITH, CAROLYN L	
		ART UNIT	PAPER NUMBER	
		1631		

DATE MAILED: 07/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)
	10/061,377	SCHNEIDER ET AL.
	Examiner	Art Unit
	Carolyn L. Smith	1631

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 21 April 2005.
- 2a) This action is FINAL.                    2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1-19,40-45,54-56,59-63,80,81 and 83-103 is/are pending in the application.
- 4a) Of the above claim(s) 3-7,11,12,14,15,19,59-63, 80-81,85 and 90 is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 1,2,8-10,13,16-18,40-45,54-56,83,84,86-89 and 91-103 is/are rejected.
- 7) Claim(s) 92 is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 01 February 2002 is/are: a) accepted or b) objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) All    b) Some \* c) None of:  
1. Certified copies of the priority documents have been received.  
2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 682005.
- 4) Interview Summary (PTO-413)  
Paper No(s)/Mail Date, \_\_\_\_\_.  
5) Notice of Informal Patent Application (PTO-152)
- 6) Other: \_\_\_\_\_.

## **DETAILED ACTION**

Applicant's amendments and remarks, filed 4/21/05, are acknowledged.

Amended claims 1-8, 10, 12-13, 16-19, 40, 44-45, 54-56, 61, 63, 81, cancelled claims 20-39, 46-53, 57-58, 64-79, 82, and new claims 83-103 are acknowledged. Claims 3-7, 11, 12, 14, 15, 19, 59-63, 80-81, 85, and 90 are withdrawn as being drawn to non-elected subject matter.

Applicant's arguments, filed 4/21/05, have been fully considered but they are not deemed to be persuasive. The arguments are addressed below as they apply to the rejections. Rejections and/or objections not reiterated from the previous office actions are hereby withdrawn. The following rejections and/or objections are either reiterated or newly applied. They constitute the complete set presently being applied to the instant application.

Claims 1-2, 8-10, 13, 16-18, 40-45, 54-56, 83-84, 86-89, and 91-103 are herein under examination.

### ***Claim Objections***

Claim 92 is objected to because of the following informality: Claim 92 is an exact duplicate of claim 91. Appropriate correction is required.

**PRIOR ART*****Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-2, 8-9, 13, 16-18, 40, 43-45, 56, 83-84, 86-89, and 91-103 are rejected under 35 U.S.C. 102(b) as being anticipated by Oplatka [Biochemical and Biophysical Research Communications, Volume 246: 301-306 (1998)] with additional support from Merriam-Webster online dictionary (“array” definition).

Oplatka disclose the presence of rotation of an assembly of protein molecules, such as myosin-actin and kinesin (dynein) – microtubules (page 306, col. 1, first paragraph) which represents a molecular rotary motor, as stated in instant claim 1. Oplatka disclose actin filaments sliding over myosin molecules fixed on a glass surface with fluorophores bound to the filaments (page 302, col. 2, third paragraph) which represents arrays of both actin and myosin as well as being disposed on a fixed surface, as stated in instant claims 1, 44-45 and 56. Oplatka disclose axial protein rotation and data which indicate actin filaments rotate in shortened muscle and microtubules rotate upon interaction with kinesin and dynein (page 306, col. 1, first paragraph and abstract, lines 9-13), which represents close contact to interact and rotate a second array relative to a first array, as stated in instant claim 1. Oplatka disclose as the thick myosin filaments

translate parallel to the actin helix the length of half an actin monomer, the actin helices themselves must each rotate by the angular separation between two vicinal actin monomers (page 301, col. 2, first paragraph) which represents an array of actin, as stated in instant claim 1. Merriam-Webster online dictionary define “array” as a group of elements forming a complete unit. Oplatka disclose actin helices rotate about their axis as the thick (myosin) and the thin (actin) filaments interdigitate and the sarcomere contracts (page 301, col. 1, last paragraph), as stated in instant claims 1, 8, and 103. Oplatka disclose axial protein rotation and data which indicate actin filaments rotate in shortened muscle and microtubules rotate upon interaction with kinesin and dynein (abstract), as stated in instant claims 87-89, 94-98, and 101-102. The above-mentioned actin helices represents a driven member, as stated in instant claims 2 and 13. Oplatka disclose the actin are connected to Z-disks which is a molecular swivel-joint and the actin filament acts as a screw due to rotation (page 301, col. 2, first paragraph) wherein the disks represent a driven member wheel as well as a cylindrical surface, as stated in instant claims 16, 83-84, 86, and 91-92, 99-100. Oplatka disclose actin filaments fixed to a glass surface and repetitive rotations (page 301, col. 2, second paragraph) which represent at least one complete rotation, as stated in instant claim 93. Oplatka disclose shifts of filaments 5.3 nm toward A bands as well as other lengths including 2.65 nm reminiscent of thin filaments stretched to isometric contraction (page 301, col. 2, last paragraph to page 302, col. 1, first paragraph). Oplatka disclose sliding two sets of filaments 4 nm to diminish isometric force down to zero in quick release experiments (page 302, col. 1, first paragraph) which represents predetermined dimensions to determine power output of the motor, as stated in instant claims 17 and 18. Oplatka disclose shortening sarcomere

length from 3.5 mm to 2.05 mm with the sliding distance changing linearly with the change in ATP consumed (page 303, col. 2, fourth paragraph) which also anticipates instant claim 17. Oplatka disclose torque (twisting power) of microtubules that serve as tracks for “motor” proteins (page 302, col. 1, second and third paragraphs). Oplatka disclose actin filaments attached to polystyrene beads (page 302, col. 2, second paragraph). Oplatka disclose actomyosin rotation is coupled with hydrolysis of ATP molecules from interactions generating a mechanical impulse via water jets and operate on water turbines (page 304, col. 2, last paragraph and page 306, col. 1, first paragraph) which represents a propeller mechanism as well as a source of ATP, as stated in instant claims 9, 40 and 43.

Thus, claims 1-2, 8-9, 13, 16-18, 40, 43-45, 56, 83-84, 86-89, and 91-103 are anticipated by Oplatka.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not

commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 10, 41-42, and 54-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oplatka [Biochemical and Biophysical Research Communications, Volume 246: 301-306 (1998)] as applied to claims 1-2, 8-9, 13, 16-18, 40, 43-45, 56, 83-84, 86-89, and 91-103 in view of Nagai et al. (US 5,499,547) with additional support from Merriam-Webster online dictionary (“array” definition).

Oplatka teaches a molecular rotary motor, as set forth above. Oplatka does not describe a fuel source regulated by a switch or valve (instant claims 41 and 42) or perforation or permeation (instant claims 10, 54, and 55).

Nagai et al. describe actuators using rotatable drive sources such as a fuel engine and biological-organism principle motor which includes coupling the drive source for effecting linear or rotational movement (col. 1, lines 11-23). Nagai et al. describe the myosin and actin forms a striated muscle (col. 7, lines 41-45). Since muscle cells are cells which are known to comprise perforations, claims 10, 54, and 55 are obviated. Nagai et al. describe supplying and controlling ATP amounts via a valve (col. 8, lines 14-25 and lines 52-55), as stated in instant claims 41-42. Nagai et al. describe fluid biochemical drive sources are united into control drivers used for drive and power sources such as biological energy (col. 1, lines 23-30). Nagai et al. describe an actuator comprises a solution section, an energy supplying section and an ATP regenerating means as well as myosins and actins (col. 7, lines 18-23). Nagai et al. describe fixing myosin and actin to surfaces (col. 7, lines 21-26). Nagai et al. describe fixing myosin to a

movable member (col. 7, lines 34-38). Nagai et al. describe using biomotors and implanting muscle filament and motors to biological materials with cylindrical surfaces, disc shapes, and disc surfaces (col. 6, lines 46-59).

Nagai et al. state coupling the drive source and drive shaft of individual activators cannot be easily performed with high accuracy (col. 1, lines 43-45). Nagai et al. state their invention minimizes the need for adjustment and maintenance of a coupling means as much as possible (col. 1, lines 54-56). Nagai et al. employ actin and myosin motors in their invention as alternatives to the motor and ball screw shaft to drive the table (col. 6, lines 46-50). Oplatka state that no relation has been made to the most fundamental process of ATP hydrolysis by the contractile proteins of actin. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to carry out the ATP generated experiments mentioned by Oplatka with a controlled, highly accurate, power source of ATP, as stated by Nagai et al. (col. 1, lines 5-8). The person of ordinary skill in the art would have been motivated to make this modification because the actuator of Nagai et al. minimizes the need for adjustment and maintenance and improves dynamic and static characteristics of connecting means to convert energy with high efficiency and accuracy (col. 1, lines 43-45 and 54-62).

Thus, Oplatka in view of Nagai et al. make obvious the instant invention.

Applicants submit that Figure 4 of the Thomas et al. reference disclosed molecular motors that moved along microtubules, but do not disclose any rotating elements. Applicants further state that claim 1 is amended to disclose molecular motors

that include at least one rotating element. These arguments are moot in view of new grounds of rejection with other prior art.

### **NON-STATUTORY SUBJECT MATTER**

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1, 2, 8-9, 13, 40-41, 43-45, 56, and 91-103 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The molecular motors as claimed encompass motors within living cells and thus are non-statutory as being directed to a product of nature. While some living cells are statutory, this occurs when the “naturally occurring” subject matter has been distinguished from those changed by the “hands of man”.

Applicants submit that the molecular motors of claims 1 and 54 are distinguishable from any molecular motor found in nature. This statement is found unpersuasive for claim 1 as the claim still encompasses a naturally occurring entity. Applicants argue that rotating elements and perforations are not found in the molecular motors disclosed by Thomas et al. It is noted that Thomas et al. and Oplatka describe motors associated with RNA and DNA, including a rotary motor that works its way along the DNA double helix, and other rotary motors *provided by nature*, such as F1-F0 ATPase with a shaft passing through a bearing with rotation experimentally recorded (Thomas et al., page 256, col. 1, first paragraph). It is noted that rotation in actin and

microtubule-based motility systems is stated in Oplatka (abstract). It is also noted that recited perforations are obvious since actin and myosin are found in muscle cells, and cells are known to comprise perforations. Therefore, the claimed molecular motors in claims 1, 2, 8-9, 13, 40-41, 43-45, 56, and 91-103 encompass those motors which are naturally occurring.

***Conclusion***

No claim is allowed.

Papers related to this application may be submitted to Technical Center 1600 by facsimile transmission. Papers should be faxed to Technical Center 1600 via the PTO Fax Center. The faxing of such papers must conform with the notices published in the Official Gazette, 1096 OG 30 (November 15, 1988), 1156 OG 61 (November 16, 1993), and 1157 OG 94 (December 28, 1993) (See 37 CFR §1.6(d)). The Central Fax Center number for official correspondence is (571) 273-8300.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Carolyn Smith, whose telephone number is (571) 272-0721. The examiner can normally be reached Monday through Thursday from 8 A.M. to 6:30 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ardin Marschel, can be reached on (571) 272-0718.

Any inquiry of a general nature or relating to the status of this application should be directed to Legal Instruments Examiner Tina Plunkett whose telephone number is (571) 272-0549.

June 23, 2005

**MARJORIE A. MORAN**  
**PRIMARY EXAMINER**

*Marjorie A. Moran*

7/22/05